

ACCESSION #: 9202040040

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Quad Cities Unit Two

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DOCKET NUMBER: 05000265

TITLE: Group I Isolation/Rx Scram From Actuation of MSL Low Pressure Switches Due to Pressure Fluctuations in Sensing Lines

EVENT DATE: 01/01/92 LER #: 91-001-00 REPORT DATE: 01/28/92

OTHER FACILITIES INVOLVED:

DOCKET NO: 05000

OPERATING MODE: 4 POWER LEVEL: 024

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION: 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

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COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

ABSTRACT:

On January 1, 1992, Quad Cities Unit Two was in the RUN mode at 24 percent of rated core thermal power. Special Test Procedure 2-104, Turbine Trip Main Steam Line Low Pressure Test, was in progress in an attempt to discover the cause for historical Group I Primary Containment Isolations (PCI) following turbine trips. At 0014 hours, the Unit Two Main Turbine was manually tripped from 200 Mwe. Within 0.5 seconds of the turbine trip, a Group I PCI occurred. A reactor scram then occurred upon ten percent closure of the Main Steam Isolation Valves (MSIV). All safety feature actuations occurred as designed. An Emergency Notification System (ENS) notification was completed at 0223 hours on January 1, 1992.

Test data obtained revealed the cause of the Group I PCI to be main steam line (MSL) pressure wave and instrument line resonance due to Turbine Stop Valve fast closure. This caused large pressure fluctuations at the location of the MSL Low Pressure Switches. This fluctuation was large enough to actuate all four switches and cause the Group I PCI. General Electric has been contracted to evaluate the test results and provide recommended corrective actions.

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END OF ABSTRACT

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PLANT AND SYSTEM IDENTIFICATION:

General Electric - Boiling Water Reactor - 2511 Mwt rated core thermal power.

EVENT IDENTIFICATION: Group I Isolation/Rx Scram from Actuation of MSL Low Pressure Switches Due to Fluctuations in Sensing Lines.

A. CONDITIONS PRIOR TO EVENT:

Unit: Two Event Date: January 1, 1992 Event Time: 0014
Reactor Mode: 4 Mode Name: RUN Power Level: 24%

This report was initiated by Deviation Report D-4-02-92-01.

RUN Mode (4) - Run - In this position the reactor system pressure is at or above 825 psig, and the reactor protection system is energized, with APRM protection and RBM interlocks in service (excluding the 15% high flux scram).

B. DESCRIPTION OF EVENT:

On December 31, 1991, Unit Two was in the RUN mode at 24 percent of rated core thermal power and in the process of shutting down for Refueling Outage Q2R11. Special Test Procedure 2-104, Turbine Trip Main Steam Line Low Pressure Test, was in progress in an attempt to discover the cause for historical Group I Primary Containment Isolation (PCI) [JCI] following turbine [TRB] trips. Special Test 2-104 was being performed in conjunction with Temporary Procedure 7313, of QCGP 2-1, Normal Unit Shutdown.

Earlier in the day, Temporary Alteration 91-2-55 was installed at turbine instrument rack [RK] 2252-1 located on the Mezzanine elevation of the Turbine Building [NM]. This temporary alteration installed four pressure transducers [TD], one at each Unit Two Main Steam Line (MSL) Low Pressure Switch 1631, and a four pen high speed strip chart recorder to monitor pressure at the switches during the ensuing turbine trip.

As part of Special Test Procedure 2-104, two high speed pen recorders were installed inside the Control Room Panels [PL] 902-5, 902-7, 902-15, and 902-17 to monitor annunciator [ANN] contacts on relays 595-103A through D, and 595-106A through D. Relays [RLY] 595-103A through D are fed from MSL Low Pressure Switches 2-261-30A, B, C, and D. Relays 595-106A through D provide the Group I PCI initiation. Main turbine throttle pressure and reactor [RCT] pressure were also monitored on these pen recorders.

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At 2355 hours, the Unit Two Operating Engineer (OE), Shift Engineer (SE), Shift Control Room Engineer (SCRE), Unit Two Nuclear Station Operator (NSO), Control Room Extra NSO, Center Desk NSO, and all testing personnel gathered in the Control Room for a pre-test briefing. The intent of the special test procedure along with the possibility of receiving a Group I PCI and reactor scram were discussed. The test director verified at this time that the operating crew had reviewed QCGP 2-3, Reactor Scram, and QCGP 250-1, Pressurizing the Main Steam Lines. After the briefing, all test personnel proceeded to their assigned test locations.

At 0010 hours, on January 1, 1992, all personnel were verified to be at their required locations, via headphone [HST] communication, for the ensuing Unit Two turbine trip. Procedures QCGP 2-3 and QCGP

250-1 were open in the Control Room and ready to be referenced. Permission was then obtained from the SE to manually trip the Unit Two Main Turbine.

At 0014 hours, the test director began a ten second countdown from the Control Room prior to tripping the turbine to allow all test teams to start the monitoring equipment. The Unit Two Main Turbine was then tripped from 260 MWe using the manual trip pushbutton located on Control Room Panel 902-7 in accordance with Temporary Procedure 7313.

Within 0.5 seconds of the turbine trip, a Group I PCI was received from the MSL Low Pressure Switches. This caused the Main Steam Isolation Valves (MSIV) [ISV] to close and initiated a reactor scram upon ten percent closure of these valves.

The expected reactor water level transient due to the collapse of voids following the scram, coupled with the lock up of the 2B Feedwater Regulating Valve (FWRV) [FCV] caused reactor water level to drop below +8 inches. This in turn initiated Group II and III PCI's Reactor Building [NG] Ventilation Isolations [VA], and Standby Gas Treatment (SBGT) [BH] initiation.

Reactor water level recovery was accomplished by manual operation of the 2A FWRV combined with the resetting of the locked up 2B FRV. The lowest reactor water level reached during this event was -1 inches.

At 0022 hours, Outboard MSIVs AO-2-0203-2A through 2D, and MSL Drain Valves [ISV] MO-2-220-1, 2, and 3 were opened in accordance with QCGP 250-1, Pressurizing the Main Steam Lines, in an attempt to equalize pressure across the Inboard MSIVs. This provided a steam path around the Inboard MSIVs and allowed reactor pressure to be controlled by the Steam Jet Air Ejectors (SJAE) [WF].

At 0059 hours, the Group I PCI was reset and Inboard MSIVs AO-2-0203-1A through 1D were reopened. A systematic reactor pressure vessel [RPV] cooldown was then initiated at 0140 hours.

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An Emergency Notification System (ENS) notification of this event was completed at 0223 hours on January 1, 1992, to comply with the requirements of 10CFR50.72(b)(2)(ii).

There were no other systems or components inoperable at the beginning of this event which could have contributed to this event.

C. APPARENT CAUSE OF EVENT:

This report is being submitted in accordance with 10CFR50.73(a)(2)(iv), which requires the reporting of any event or condition that results in manual or automatic actuation of any Engineered Safety Feature (ESF), including the Reactor Protection System (RPS) [JC].

The spurious Group I PCI is believed to be caused by main steam line pressure wave and instrument line resonance due to Turbine Stop Valve [ISV] fast closure. It appears from the pressure traces obtained that steam line wave propagation reinforced instrument line resonance to yield accentuated pressure fluctuations at the location

of the MSL Low Pressure Switches. This fluctuation was large enough to actuate all four pressure switches. The data obtained indicates that the lowest pressure measured at the MSL Low Pressure Switches during this event was approximately 872 psig. These switches were calibrated and functionally tested on December 14, 1991, with an as-left setpoint of 855 psig for the A, C, and D switches and 854 psig for the B switch. It is not known at this time why the switches actuated at a higher pressure than their setpoint.

Data obtained from the two pen recorders installed to monitor relay actuation indicated that MSL Low Pressure relays 595-103A through D de-energized for less than 75 milliseconds during this event. This was sufficient time to allow normally closed contacts (closed when relay is energized) 1-2 on each relay to momentarily open and cause Group I PCI relays 595-106A through D to de-energize. Relays 595-103A through D apparently were not de-energized long enough to allow normally open contacts 7-8 on each relay to close and provide MAIN STEAM LINE PRESS LOW alarms [ALM] on the Control Room Alarm Typer [PRNT]. These alarms, one for each main steam line, were not received until after the MSIVs were full closed.

Data obtained also indicated that Group I PCI relays 595-106A through D de-energized for less than 100 milliseconds during this event. This was sufficient time to allow normally closed contacts 1-2, 3-4, 5-6, and 7-8 to open and cause the Group I PCI. Relay 595-106A apparently was not de-energized long enough to allow normally open contacts 11-12 to close and provide a CNMT ISOLATION GRP I alarm on the Control Room Alarm Typer. Currently, relay 595-106A is the only Group I PCI relay which is wired to provide this computer alarm. A review of other Unit Two spurious Group I PCI events revealed that the CNMT ISOLATION GRP I computer alarm is never received. It has, however, been received during previous Unit One events.

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The cause for the lock-up of the 2B FWRV is unknown. The Unit Two NSO was able to reset the valve immediately following the scram.

The other Group I PCI initiators are MSL High Radiation [IL], MSL High Flow, MSIV Room High Temperature, and Reactor Water Low-Low Level. There were no alarms or indications received to indicate that any of these conditions occurred during this event.

D. SAFETY ANALYSIS OF EVENT:

The safety significance of this event is minimal. All expected Engineered Safety Features (ESF) occurred as desired to bring the reactor to a safe shutdown condition. A Group I PCI occurs when main steam line pressure drops below 825 psig in the RUN mode. This function is provided for protection against a pressure regulator malfunction which would cause the control and/or bypass valves to open. With the trip set at 825 psig, inventory loss and peak cladding temperatures are limited so that fuel is not uncovered and fission products are not available for release. A reactor scram occurs in the RUN mode when the MSIVs are less than 90 percent open in anticipation of the pressure and flux transients which occur when the valves fully close. If the MSIV scram had failed, a reactor scram would have occurred from an Average Power Range Monitor (APRM) high neutron flux.

E. CORRECTIVE ACTIONS:

Site Engineering Services Request (SESR) 4-861 was initiated on January 3, 1992, to have General Electric (GE) evaluate the results of Special Test 2-104 and provide recommended corrective actions (NTS #254 200 91 14903).

Minor Design Change (MDC) P04-1(2)-90-134 is modifying the existing logic for the computer point associated with a Group I PCI. Currently, the computer point for a Group I Isolation is initiated on a trip of one PCI system channel only. This MDC will revise the computer point to match the isolation trip logic of "one-out-of-two-taken-twice." This work is scheduled to be performed during the current refuel outage, Q2R11, for Unit Two and during the next refuel outage, Q1R12, for Unit One (NTS #265 200 92 00101).

Nuclear Work Request (NWR) Q97142 was initiated for the Instrument Maintenance department to investigate the cause for the lock-up of the 2B FWRV during the scram. It is planned to inspect and calibrate both the trip unit and loss of signal detector. All wiring and connections will also be inspected and cleaned (NTS #265 200 92 00102).

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F. PREVIOUS EVENTS:

An extensive search was conducted of previous turbine trips/reactor scrams at Quad Cities Station. There were five previous documented events where a spurious Group I Isolation occurred subsequent to a turbine trip/reactor scram. It was found that the spurious Group I PCIs only occurred when a turbine trip caused a reactor scram (Main Stop Valves closed first). An unexplained Group I has never occurred when a reactor scram precedes a turbine trip or on a Turbine-Generator Load Rejection. Additionally, it was noted that the Group I Isolations occur at various power levels. The five previous events are documented under the following Deviation Reports (DVR):

DVR/LER#	DESCRIPTION	% POWER
04-01-91-149 91-025	Rx Scram Due to Turbine Trip from Rx Water High Level Due 1A FRV Failing Full Open	78%
04-02-90-053 90-010	U2 Rx Scram Due to Turbine Trip from 2C Moisture Sep. High Level	100%
04-01-89-058 89-010	Rx Scram from an Induced Voltage Due to a Loose Wire on the Condenser Low Vacuum Pressure Switch Indicating Lamp (Condenser Low Vacuum Turbine Trip)	94%
04-02-89-019 89-001	Turbine Trip - Rx Scram while Testing Turbine Master Trip Solenoid	80%
04-02-88-015 88-005	U2 Rx Scram Due to Feedwater Reg. Valve Packing Failure	45%

G. COMPONENT FAILURE DATA:

A component failure did not contribute to this event.

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ATTACHMENT 1 TO 9202040040

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Commonwealth Edison
Quad Cities Nuclear Power Station
22710 206 Avenue North
Cordova, Illinois 61242
Telephone 309/654-2241

RLB-92-028

January 24, 1992

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Reference: Quad Cities Nuclear Power Station
Docket Number 50-265, DPR-30, Unit Two

Enclosed is Licensee Event Report (LER) 92-001, Revision 00, for Quad Cities Nuclear Power Station.

This report is submitted in accordance with the requirements of the Code of Federal Regulations, Title 10, Part 50.73(a)(2)(iv). The licensee shall report any event or condition that resulted in manual or automatic actuation of any Engineered safety feature.

Respectfully,

COMMONWEALTH EDISON COMPANY
QUAD CITIES NUCLEAR POWER STATION

R. L. Bax
Station Manager

RLB/TB/plm

Enclosure

cc: J. Schrage
T. Taylor
INPO Records Center
NRC Region III

STMGR 272

*** END OF DOCUMENT ***

